

Write Serial No. of your answer book _____

Time Allowed : 30 Minutes

Maximum Marks : 20

Signature of Deputy Supdt. _____

Note : Use this paper to write the answers to the objective questions. No mark will be awarded for cutting, over-writing or using a pencil. This paper must be tagged with the answer-book.

1. Some possible answers to each statement are given below. Tick (✓) mark the correct answer : 20

- (i) The number 1 is a : (Prime number. Irrational. Even number. Odd number.)
- (ii) Every set is a ----- subset of itself : (Proper. Improper. Finite. Infinite.)
- (iii) If $A = \begin{bmatrix} 2 & 1 \\ 6 & 3 \end{bmatrix}$ then cofactor of 6 is : (1 , -1 , -6 , 3)
- (iv) If $|A|$ is the determinant of a square matrix A then $|A|$ is :
(Always positive. Modulus of A . Always -ve , may be +ve or -ve)
- (v) If $4^x = \frac{1}{2}$ then x equals : ($\frac{1}{2}$, $-\frac{1}{2}$, 2 , -2)
- (vi) If polynomial $x^2 + 3x + 7$ is divided by $x + 1$ then remainder is :
(-5 , 11 , 5 , -11)
- (vii) $\frac{1}{(x^2 + 1)(x + 1)}$ equals : ($\frac{A}{x^2 + 1} + \frac{Bx + C}{x + 1}$, $\frac{A}{x^2 + 1} + \frac{B}{x + 1}$,
 $\frac{Ax + B}{x^2 + 1}$, $\frac{Ax + B}{x^2 + 1} + \frac{C}{x + 1}$)
- (viii) Common difference of the A.P. 17,13,9, ---- equals : (4 , -4 , 30 , 15)
- (ix) No term in G.P. is : (3 , 2 , 1 , 0)
- (x) H.M between a and b is :
($\frac{a + b}{2ab}$, $\frac{2ab}{a + b}$, $\frac{2ab}{a - b}$, $\frac{a - b}{2ab}$)
- (xi) With usual notation 6P_4 equals : (160 , 260 , 360 , 340)
- (xii) A die is rolled then $n(S)$ equals : (36 , 6 , 1 , 9)

(Turn Over)

(2)

1. (xiii) The second term in the expansion of $(1-2x)^{\frac{1}{2}}$ is :

(x , $2x$, $3x$, $4x$)

(xiv) $\sin^2\alpha + \cos^2\beta$ equals : (1 , 0 , -1 , None of these)

(xv) Co-ratio of cosine is : (\sec , sine , cosec , \cos)

(xvi) Domain of $y = \cos x$ is :

($-\infty < x < +\infty$, $-1 \leq y \leq 1$, $0 < x < \infty$, $-\infty < x < 0$)

(xvii) Number of elements of a triangle are : (3 , 4 , 6 , 8)

(xviii) Radius r of inscribed circle is given as :

($\frac{\Delta}{s}$, $\frac{s}{\Delta}$, $\frac{\Delta}{s-c}$, $\frac{4\Delta}{abc}$)

(xix) $2\tan^{-1} A$ equals : ($\tan^{-1} \frac{A}{1-A^2}$, $\tan^{-1} \frac{2A}{1+A^2}$,

$\tan^{-1} \frac{2A}{1-A^2}$, $\frac{2A}{1-A^2}$)

(xx) If $\cos x = \frac{-\sqrt{3}}{2}$, then reference angle of $\cos x$ is :

($\frac{\pi}{3}$, $\frac{\pi}{4}$, $\frac{\pi}{6}$, $-\frac{\pi}{6}$)

Note : All questions are to be attempted on the answer book.

SECTION – I

2. Write any TWENTY FIVE short answers of the following questions :

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- (i) Prove that $(\overline{z_1 + z_2}) = \overline{z_1} + \overline{z_2}$, $\forall z_1, z_2 \in \mathbb{C}$
 (ii) State the closure property of multiplication of the set of real number \mathbb{R} .
 (iii) Define a graph (G, \mathcal{K})
 (iv) What is deduction.
 (v) What is the associative binary operation?
 (vi) Define identity matrix.

(vii) If $A = \begin{bmatrix} 2 & 3 \\ 1 & 5 \end{bmatrix}$ find $|A|$

(viii) Define row echelon form of a matrix.

(ix) Solve the equation $\frac{a}{ax-1} + \frac{b}{bx-1} = a+b$

(x) Evaluate $(1 - \omega - \omega^2)^8$

(xi) If α, β are the roots of the equation $x^2 - px - p - c = 0$ prove that $(1 + \alpha)(1 + \beta) = 1 - c$

(xii) Prove that $\frac{x^2}{a^2} + \frac{(mx+c)^2}{b^2} = 1$ will have equal roots
 if $c^2 = a^2 m^2 + b^2$

(xiii) Resolve $\frac{x^2 + 1}{(x+1)(x-1)}$ into partial fractions

(xiv) Find the nth term of the sequence $\left(\frac{4}{3}\right)^2, \left(\frac{7}{3}\right)^2, \left(\frac{10}{3}\right)^2, \dots$

(xv) Find the sum of the infinite geometric series $\frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \dots$

(xvi) Find the 12th term of H.P. $\frac{1}{2}, \frac{1}{5}, \frac{1}{8}, \dots$

(xvii) Find G.M. between $-2i$ and $8i$

(xviii) Verify that $A > G > H$, ($G > 0$) if $a = 2, b = 8$

(xix) Find the value of n when ${}^{11}P_n = 11.10.9$

(xx) How many diagonals can be formed by joining the vertices of the polygon having 5 sides?

(xxi) From a box containing slips numbered 1,2,3, ..., 5 one slip is picked up, find the probability that the number on the slip is a prime number.

(xxii) Evaluate ${}^{12}C_3$

(xxiii) Prove that $1 + 3 + 5 + \dots + (2n-1) = n^2$ for $n = 1, 2$

(Turn Over)

(2)

2. (xxiv) Find the term involving x^4 in the expansion of $(3 - 2x)^7$
 (xxv) Expand $(8 - 2x)^{-1}$ upto four terms.
 (xxvi) Prove that $1 + \cot^2 \theta = \operatorname{cosec}^2 \theta$
 (xxvii) Find the values of all trigonometric function at $\theta = 390^\circ$
 (xxviii) Prove that $\sin(360 - \theta) = -\sin \theta$
 (xxix) Prove that $\sin 2\alpha = 2 \sin \alpha \cdot \cos \alpha$
 (xxx) Prove that $\cos 20^\circ + \cos 100^\circ + \cos 140^\circ = 0$
 (xxxii) Find the period of $3 \cos \frac{x}{5}$
 (xxxiii) When the angle between the ground and the sun is 30° , flag pole casts a shadow of 40 m long? Find the height of the top of the flag.
 (xxxiiii) Solve the triangle ABC if $a = 32$, $b = 40$, $c = 66$
 (xxxv) Find the area of the triangle ABC where $b = 37$, $c = 45$, $\alpha = 30^\circ 50'$
 (xxxvi) Show that $r_1 = s \tan \frac{\alpha}{2}$
 (xxxvii) Show that $\tan[\sin^{-1} x] = \frac{x}{\sqrt{1-x^2}}$
 (xxxviii) Solve the equ. $\sin 2x = \cos x$

SECTION - II

Note : Attempt any THREE questions.

3. (a) Prove that $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$ 5
 (b) Prove that the determinant 5

$$\begin{vmatrix} b+c & a & a^2 \\ c+a & b & b^2 \\ a+b & c & c^2 \end{vmatrix} = (a+b+c)(a-b)(b-c)(c-a)$$
4. (a) Show that the roots of the equation $(p+q)x^2 - px + q = 0$ will be rational. 5
 (b) Sum to n terms the series 5
 $1 + (a+b) + (a^2 + ab + b^2) + (a^3 + a^2b + ab^2 + b^3) + \dots$
5. (a) There are 8 men and 10 women of a club. How many committees of seven can be formed having at least 4 girls. 5
 (b) Find the term independent of x in the expansion of $\left(x - \frac{2}{x}\right)^{10}$. 5
6. (a) Prove that $\frac{\tan \theta + \sec \theta - 1}{\tan \theta - \sec \theta + 1} = \tan \theta + \sec \theta$ 5
 (b) Prove that $\cos 20^\circ \cos 40^\circ \cos 60^\circ \cos 80^\circ = \frac{1}{16}$ 5
7. (a) Prove that $R = \frac{a}{2 \sin \alpha} = \frac{b}{2 \sin \beta} = \frac{c}{2 \sin \gamma}$ with usual notations. 5
 (b) Prove that $2 \tan^{-1} \frac{1}{3} + \tan^{-1} \frac{1}{7} = \frac{\pi}{4}$ 5